

Appendix C

Tobamovirus RNA dependent RNA polymerase

A three-dimensional structure of a RNA-dependent RNA polymerase, that encoded by poliovirus, has been reported by Hansen et al. The alignment used for tree construction is enhanced below by the amino acid sequence of the poliovirus RdRP aligned to the tobamoviral RdRp's. A 3D line is provided that identifies the helices (upper case Roman) and beta-structure elements (numerals) described in that report. The footnote line refers to notes at the bottom that relate to functional or structural comments.

	1
<u>TMV-vul</u>	--MQFYFDKCLPGNSTMMNNFD---AVTMRLTDISLNVKDCILDMSKSV
<u>TMV-Rak</u>	--MQFYFDKCLPGNSTMMNNFD---AVTMRLTDISLNVKDCILDMSKSV
<u>TMV-WANG</u>	--MQFYFDKCLPGNSTMMNNFD---AVTMRLTDISLNVKDCILDMSKSV
<u>TOMV-L</u>	--MQFYFDKCLPGNSTILLNNYD---AVTMKLTDISLNVKDCILDMSKSV
<u>TMV-KR</u>	--MQFYFDKCLPGNSTMMNNFD---AVTMRLTDISLNVKDCILDMSKSV
<u>PMMV</u>	--MQYYFDKCLPGNSTILNEYD---AVTMQIRENSLNVKDCVLDMSKSV
<u>TMGMV</u>	PDLQFYFDVCLPGNSTILNKYD---AVTMRLRDNSLNVKDCVLDMSKSV
<u>ORSV</u>	--MQFYDITLLPGNSTILNEYD---AVTMNLRENNLNVKDCITIDFSKSV
<u>TVCV</u>	--MQFYDALLPGNSTILNEFD---AVTMNLRDISLNVKDCRIDFSKSV
<u>CR-TMV</u>	--MQFYDITLLPGNSTILNEYD---AVTMNLRDISLNVKDCRIDFSKSV
<u>RMV-SH</u>	--MQFYDITLLPGNSTILNEFD---AVTMNLRDISLNVKDCRIDFSKSV
<u>CRMV</u>	--MQFYDITLLPGNSTILNEFD---AVTMNLRDISLNVKDCRIDFSKSV
<u>TMV-CG</u>	--MQFYDITLLPGNSTILNEFD---AVTMNLRDISLNVKDCRIDFSKSV
<u>TMV-OB</u>	QDLQFYFDKCLPGNSTVLNEFD---AVTMNCSDISLNVKDCVLDMSKSV
<u>CGMMV</u>	--MQEFYDRCLPGNSFVLNDFD---AVTMRLRDNEFNLQPCRLTSLNLD
<u>CGMMV-W</u>	TDMQEFYDRCLPGNSFVLNDFD---AVTMRLRDNEFNLQPCRLTSLNLD
<u>CFMMV</u>	--MQNFYDACLPGNSFVLNDYD---SVTMRLVDNEINLQPCRLTSLKADP
<u>YCGMMV</u>	TDMQSFYDACLPGNSFVLNDYD---SVTMRLADNEFNLQPCRLTSLKADP
<u>SHMV</u>	--LQFYFDSWLPGNSFVQNNHD---QWSI ISSDINLHSEAVRLDMNKRH
<u>POLIORDRP</u>	GEIQWMPRSKEVGYPIINAPSKTKLEPSAFHY-VFEGVKEPAVLTKNDR
3D	-----
Footnote	11 1
TMV VUL	AP---KDQIK-PLIPMVRTAAEMPRQTGLLENLVAMIKRNFNAPELSGII
TMV-RAK	AP---KDQIK-PLIPMVRTAAEMPRQTGLLENLVAMIKRNFNAPELSGII
TMV WANG	AP---KDQIK-PLIPMVRTAAEMPRQTGLLENLVAMIKRNFNAPELSGII
TOMV L	AP---KDVKP-TLIPMVRTAAEMPRQTGLLENLVAMIKRNFNSPELSGVV
TMV-KR	AP---KDQIK-PLIPMVRTAAEMPRQTGLLENLVAMIKRNFNAPELSGII
PMMV	LP---RESET-TLKPVIRTAAEKPRKPGLLENLVAMIKRNFNSPELVGVV
TMGMV SPA	MP---KEVKP-CLEPVLRTAAEPRAAGLLENLVAMIKRNFNAPDLTGTI
ORSV	VP---RQEE-FFTPVIRTAAPERPRAGLLENLVAMIKRNFNSPDLTGIL
TVCV	LP---KEQPI-FLKPKIRTAAMPRTAGLLENLVAMIKRNMNAPDLTGTI
CR-TMV	LP---KEQPI-FLKPKIRTAAMPRTAGLLENLVAMIKRNMNAPDLTGTI
RMV-SH	VP---KERPV-FMKPKLRTAAEMPRTAGLLENLVAMIKRNMNAPDLTGTI
CRMV	VP---KERPV-FMKPKLRTAAEMPRTAGLLENLVAMIKRNMNAPDLTGTI
TMV-CG	LP---RERPI-FMKPKLRTAAEMPRTAGLLENLVAMIKRNMNAPDLTGTI
TMV OB	LP---RDNTKVPMTVPVIRTAAPERPRSQGLLENLVAMIKRNFNSPELSGT
CGMMV	VPALIKNEAQNFILPVLRTACERPRIPGLLENLVAMIKRNMNTPDLAGTV
CGMMV-W	VPALVKSEAQNFLIPVLRTACERPRIPGLLENLVAMIKRNMNTPDLAGTV
CFMMV	VTESLKMEKKEFLIPLGKTATERPRIPGLLENLIAIVKRNFNTPDLAGSL
YCGMMV	VAESIKLERKNIDKLDKTATERPRIPGFLENLVAIVKRNFNTPDLAGVL
SHMV	----IPRTKGEFLRPLLNTAVEPPRIIPGLLENLLALIKRNFNAPDLAGQL
POLIORDRP	L----K-TNFEEAIFSKYVGNKITEVDEHMKEAVDHYAGQLMSLDINTEQ
3D	-----AAAAAAAAAAAAAAAA-----
Footnote	
TMV VUL	DIENTASLVVDKFFDSYLLKE-----KRKPNKNVSLFSRESLNRWLEKQE
TMV-RAK	DIENTASLVVDKFFDSYLLKE-----KRKPNKNVSLFSRESLNRWLEKQE
TMV WANG	DIENTASLVVDKFFDSYLLKE-----KRKPNKNVSLFSRESLNRWLEKQE
TOMV L	DIENTASLVVDKFFDSYLLKE-----KRKPNKNVSLFSRESLNRWIAKQE
TMV-KR	DIENTASLVVDKFFDSYLLKE-----KRKPNKNVSLFSRESLNRWLEKQE

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PMMV      DIEDTASLVVDKFFDAYLIKE-----KKKP-KNIPLLSRASLERWIEKQE
TMGMV SPA DIESTASVVVDKFFDSYFIKK-----EKYTKNIAGVMTKDSMMRWLENRK
ORSV      DIEDTAELVVNKFWDAYIIDE-LSGGNVTPM-----TSDAFHRWMAKQE
TVCV      DIEDTASLVVEKFWDSDYVDKE-FSGTNEMTM-----TRESFSRWLSKQE
CR-TMV    DIEDTASLVVEKFWDSDYIDKE-FSGTNEMTM-----TRESFSRWLSKQE
RMV-SH    DIEDTASLVVEKFWDAYVVKE-FSGTDGMAM-----TRESFSRWLSKQE
CRMV      DIEDTASLVVEKFWDAYVVKE-FSGTDGMAM-----TRESFSRWLSKQE
TMV-CG    DIEDTASLVVEKFWDAYVVKE-FSGTDGMAM-----TRESFSRWLSKQE
TMV OB    DMENTASVVADRFFDSYFLKDKLSGCSLGDSSGKNIIDRQALIRWMEKQE
CGMMV     DITNMSISIVDNFFSSSVRDE-V---LLDHLDCVRASSIQSFSDWFSCQP
CGMMV-W   DITNMSISIVDNFFSSSVRDE-V---LLDHLDCVRASSIQSFSDWFSCQP
CFMMV     DISSISKGVVDNFFSTFLRDE-Q---LADHLCKVRSLSLSESFAWFDNQS
YCGMMV    DIDTISKSVVDNFFTTFLRDE-Q---LSDHLVRVRSCSLESFAWFHNQA
SHMV      DYDFLSRKVCDGFFGKLLPPD-VEASELLRLPVDHMYSVQNFDDWLNKQE
POLIORDRP MCLEDAMYGTGDLALDLS-----AGYPYVAMGKKKRDILN-----
3D

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Footnote

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TMV VUL    QVTIGQLADFDVFDLPAVDQYR-HMYKAQPKQKLDTSIQTEYPA-LQTIV
TMV-RAK    RVTIGQLADFDVFDLPAVDQYR-HMIKAQPKQKLDTSIQTEYPA-LQTIV
TMV WANG    QVTIGQLADFDVFDLPAVDQYR-HMIKAQPKQKLDTSIQTEYPA-LQTIV
TOMV L     QVTIGQLADFDVFDLPAVDQYR-HMIKAQPKQKLDLSIQTEYPA-LQTIV
TMV-KR     QVTIGQLADFDVFDLPAVDQYR-HMIKAQPKQKLDTSIQTEYPA-LQTIV
PMMV      KSTIGQLADFDLPAVDQYR-HMIKQPKQRLDLSIQTEYPA-LQTIV
TMGMV SPA  EVLLDDLANYNFTDLPAIDQYK-HMIKAQPKQKLDLSIQNEYPA-LQTIV
ORSV      KSTIRQLADFDVFDLPAIDQYK-HMIKAQPKQKLDLSPQDEYAA-LQTIV
TVCV      SSTVGQLADFNFDLPAVDEYK-HMIKSQPKQKLDLSIQDEYPA-LQTIV
CR-TMV     SSTVGQLADFNFDLPAVDEYK-HMIKSQPKQKLDLSIQDEYPA-LQTIV
RMV-SH     SSTVGQLADFNFDLPAVDEYK-HMIKSQPKQKLDLSIQDEYPA-LQTIV
CRMV      SSTVGQLADFNFDLPAVDEYK-HMIKSQPKQKLDLSIQDEYPA-LQTIV
TMV-CG     SSTVGQLADFNFDLPAVDEYK-HMIKSQPKQKLDLSIQDEYPA-LQTIV
TMV OB     KSTIGQLADYDFVFDLPAIDQYR-HIISQPKQKLDLSIQSEYPS-LQTIV
CGMMV     TSAVGQLANFNFDLPAFDTYM-HMIKRQPKSRDLSIQSEYPA-LQTIV
CGMMV-W   TSAVGQLANFNFDLPAFDTYM-HMIKRQPKSRDLSIQSEYPA-LQTIV
CFMMV     TCALGQLSNFDFVLDLPPVDVYN-HMIKRQPKSKLDTSIQSEYPA-LQTIV
YCGMMV    TAAMGQLANFDLPPVDMYT-HMIKRQPKSKLDTSIQSEYPA-LQTIV
SHMV      PGVVGQLANWDHIGMPAADQYR-HMIKRTPKAKLDLSIQSEYPA-LQTIV
POLIORDRP KQTRDTKEMQKLLDTYGINLPLVTYVKDELRSKTKV-EQGKSRLIEASSL
3D

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Footnote

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TMV VUL    YHSKKINAI FGPLFSELTRQLLDSVDSSRFLFFTRKTPAQIEDFFGDLDLS
TMV-RAK    YHSKKINAI FGPLFSELTRQLLDSVDSSRFLFFTRKTPAQIEDFFGDLDLS
TMV WANG    YHSKKINAI FGPLFSELTRQLLDSVDSSRFLFFTRKTPAQIEDFFGDLDLS
TOMV L     YHSKKINAI FGPLFSELTRQLLDSIDSSRFLFFTRKTPAQIEDFFGDLDLS
TMV-KR     YHSKKINAI FGPLFSELTRQLLDSVDSSRFLFFTRKTPAQIEDFFGDLDLS
PMMV      YHSKKINALFGPVFSELTRQLLETIDSSRFMFYTRKTPAQIEEFFSDLDLS
TMGMV SPA  YHSKQINGILAG-FSELTRLLEAFDSKKFLFFTRKTPAQIEEFFSDLDLS
ORSV      YHSKQINAI FGPLFAELTRQLLERIDSSKFLFYTRKTPAQIEEFFSDLDLS
TVCV      YHSKKINAI FGPMFSELTRMLLERIDSSKFLFYTRKTPAQIEDFFSDLDLS
CR-TMV     YHSKKINAI FGPMFSELTRMLLERIDSSKFLFYTRKTPAQIEDFFSDLDLS
RMV-SH     YHSKKINAI FGPMFSELTRMLLERIDTSKFLFYTRKTPAQIEEFFSDLDLS
CRMV      YHSKKINAI FGPMFSELTRMLLETIDTSKFLFYTRKTPAQIEEFFSDLDLS
TMV-CG     YHSKKINAI FGPMFSELTRMLLERIDTSKFLFYTRKTPAQIEEFFSDLDLS
TMV OB     YHSKKINALFGPIFSELTRQMLSAIDTSRYLFFTRKTPAQIEEFFSDLDA
CGMMV     YHPKVNAVFGPVFKYLTTKFLSMVDSSKFFFYTRKKPEDLQEFFSDLSS
CGMMV-W   YHPKVNAVFGPVFKYLTTKFLSMVDSSKFFFYTRKKPEDLQEFFSDLSS
CFMMV     YHSKLVNAVFGPVFRYLTSEFLSMVDNSKFFFYTRKLRMICKFLFPHFPN
YCGMMV    YHSKLVNAVFGPVFRYLTSEFLSMVDNSKFFFYTRKTPEDLQSFFSTLSA
SHMV      YHSKLVNAVFGPIFSCLETERLLSVVDPLRFKFFTRTPADLEFFFRDMVV
POLIORDRP NDSVAMRMAFGNLYAAAFHK-----NPGVITGSAVGCDPDLFWSKIPV
3D        ----BBBBB-CCCCCCCC-----DDDDDD

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Footnote          aaaaaaaaaa
TMV VUL           HVPMDVLELDISKYDKSQNEFHCAVEYEIWRRLGFEDFLGEVWKQGHRKT
TMV-RAK           HVPMDVLELDISKYDKSQNEFHCAVEYEIWRRLGFEDFLGEVWKQGHRKT
TMV WANG          HVPMDVLELDISKYDKSQNEFHCAVEYEIWRRLGFEDFLGEVWKQGHRKT
TOMV L            HVPMDVLELDVSKYDKSQNEFHCAVEYEIWRRLGLEDFLAEVWKQGHRKT
TMV-KR            HVPMDVLELDISKYDKSQNEFHCAVEYEIWRRLGFEDFLGEVWKQGHRKT
PMMV              NVPMDILELDISKYDKSQNEFHCAVEYEIWKRLGLDDFLAEVWKHGHRKT
TMGMV SPA         HVPMDVLELDISKYDKSQNEFHCAVEYEIWKRLGLNEFLAEVWKQGHRKT
ORSV              TVPMEALVLDISKYDKSQNEFHCAVEYFIWEKLGNGFLEEVWKQGHRKT
TVCV              TQAMEILELDISKYDKSQNEFHCAVEYKIWEKLGIDEWLAEVWKQGHRKT
CR-TMV            TQAMEILELDISKYDKSQNEFHCAVEYKIWEKLGIDEWLAEVWKQGHRKT
RMV-SH            SQAMEILELDISKYDKSQNEFHCAVEYKIWEKLGIDEWLAEVWRQGHRKT
CRMV              SQAMEILELDISKYDKSQNEFHCAVEYKIWEKLGIDDLAEVWRQGHRKT
TMV-CG            SQAMEILELDISKYDKSQNEFHCAVEYKIWEKLGIDDLAEVWRQGHRKT
TMV OB            HQPMEVLELDVSKYDKSQNEFHCAVEYEIWKRLGIDEFLAEVWKQGHRKT
CGMMV             HSDYEILELDVSKYDKSQSDFHFSIEMAIWEKLGDDILAWMWSMGHKRT
CGMMV-W           HSDYEILELDVSKYDKSQSDFHFSIEMAIWEKLGDDILAWMWSMGHKRT
CFMMV             KQYEILELDVSKYDKSQNDFHQAVEMLIWERLGLDDILARIWEMGHKKT
YCGMMV            KESYEILELDVSKYDKSQTDFHQAVEMLIWERLGLDDVLARIWEMGHKKT
SHMV              -GDMEILELDISKYDKSQNKFHFEVEMRIWEMLGIDKYIEKVWENGHRKT
POLIORDRP         LMEEKLFAFDYTGYSASLSPAWFEALEMVLKIGFGDRVDYIDYLNHSHH
3D                D---11111111-EEEE---FFFFFFFFFFFFFF--GGGGGG-----
Footnote          4          6
TMV VUL           TLKDYTAGIKTCIWYQRKSGDVTTFIGNTVIIAACLASMLPME-----K
TMV-RAK           TLKDYTAGIKTCIWYQRKSGDVTTFIGNTVIIAACLASMLRME-----K
TMV WANG          TLKDYTAGIKTCIWYQRKSGDVTTFIGNTVIIAACLASMLPME-----K
TOMV L            TLKDYTAGIKTCLWYQRKSGDVTTFIGNTVIIASCLASMLPME-----K
TMV-KR            TLKDYTAGIKTCIWYQRKSGDVTTFIGNTVIIAACLASMLPME-----K
PMMV              TLKDYTAGIKTCLWYQRKSGDVTTFIGNTIIIAACLSSMLPME-----R
TMGMV SPA         TLKDYIAGIKTCLWYQRKSGDVTTFIGNTVIIAACLGSMPLPME-----K
ORSV              SLKDYTAGIKTCLWYQRKSGDVTTFIGNTVIIAACLASMI PMD-----K
TVCV              TLKDYTAGVKTCLWYQRKSGDVTTFIGNTIIIAACLSSMI PMD-----K
CR-TMV            TLKDYTAGIKTCLWYQRKSGDVTTFIGNTIIIAACLSSMI PMD-----K
RMV-SH            TLKDYTAGIKTCLWYQRKSGDVTTFIGNTIIIAACLSSMI PMD-----K
CRMV              TLKDYTAGIKTCLWYQRKSGDVTTFIGNTIIIAACLSSMI PMD-----K
TMV-CG            TLKDYTAGIKTCLWYQRKSGDVTTFIGNTIIIAACLSSMI PMD-----K
TMV OB            TLKDYTAGIKTCLWYQRKSGDVTTFIGNTVIIAACMASMLPME-----K
CGMMV             ILQDFQAGIKTLIYYQRKSGDVTTFIGNTFIIAACVASMLPLD-----K
CGMMV-W           ILQDFQAGIKTLIYYQRKSGDVTTFIGNTFIIAACVASMLPLD-----K
CFMMV             HISDFQAGIKTLIYYQRKSGDVTTFIGNTFIIAACVASMVPLS-----R
YCGMMV            SISDFQAGIKTVIYYQRKSGDVTTFIGNTFIIAACVASMIPLS-----R
SHMV              HLRDYTAGIKTVIEYQRKSGDVTTFIGNTIIIAACLCSILPME-----K
POLIORDRP         LYKNKTYCVKGGM-----PSGCSGTSIFNSMINNLIIRTLLKTYKGIDLD
3D                -----HHHHHHHHHHHHHHHHHHHHHHHHHH-----
Footnote          5          aaaaaa
TMV VUL           IIKGAFCGDDSLLYFPKGCEFPDV-QHSA--NLMWNFEAK-----LFKKQ
TMV-RAK           IIKGAFCGDDSLLYFPKGCEFPDI-QHSV--NLMWNFEAK-----LFKKQ
TMV WANG          IIKGAFCGDDSLLYFPKGCEFPDV-QHSA--NLMWNFEAK-----LFKKQ
TOMV L            LIKGAFCGDDSLLYFPKGCEY PDI-QQAA--NLMWNFEAK-----LFKKQ
TMV-KR            IIKGAFCGDDSLLYFPKGCEFPDV-QHSA--NLMWNFEAK-----LFKKQ
PMMV              LIKGAFCGDDSLIYFPKGTDFPDI-QQGA--NLLWNFEAK-----LFRKR
TMGMV SPA         VIKGAFCGDDSVLYFPKGLDFPDI-QSCA--NLMWNFEAK-----LYRKR
ORSV              VIKAAFCGDDSI LDI PKGLDLPDI-QSEA--NLMWNFEAK-----LYRKR
TVCV              VIKAAFCGDDSLIYI PKGLDLPDI-QAGA--NLMWNFEAK-----LFRKK
CR-TMV            VIKAAFCGDDSLIYI PKGLDLPDI-QAGA--NLMWNFEAK-----LFRKK
RMV-SH            VIKAAFCGDDSLIYI PKGLDLPDI-QAGA--NLTWNFEAK-----LFRKK
CRMV              VIKAAFCGDDSLIYI PKGLDLPDI-QAGA--NLTWNFEAK-----LFRKK
TMV-CG            VIKAAFCGDDSLIYI PKGLDLPDI-QAGA--NLTWNFEAK-----LFRKK
TMV OB            VIKAAFCGDDSLVYLPKGCELPNI-QSCA--NLMWNFEAK-----LFKKT
CGMMV             CFKASFCGDDSLIYLPKGLEY PDI-QATA--NLVWNFEAK-----LFRKK

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CGMMV-W   CFKASFCGDDSLIYLPKGGLEYPDI-QATA--NLVWNFEAK-----LFRKK
CFMMV     SFKAAFCGDDSLIYMPPNLEYNDI-QSTA--NLVWNFEAK-----LYKKK
YCGMMV    SFKASFCGDDSLIYMPPGLEYPDI-QATA--NLVWNFEAK-----LFKKR
SHMV      VFKAFCGDDSIYLPRLNLLYPDI-QSVS--NNMWNFEAK-----LFKKL
POLIORDRP HMKMIAYGDDVIASYPHEVDASLLAQSGKDYGLTMTPADKSAIFETVTWE
3D        222222---333333-----IIIIIIIIIIII-4444-----
Footnote          44          9 9
TMV VUL    YGYFCGRYVIHHDRCIVYYDPLKL-ISKLGAKHIKDEHLEEFRRSLCD
TMV-RAK    YGYFCGRYIIHHDRCIVYYDPLKL-ISKLGAKHIKDEHLEEFRRSLCD
TMV WANG    YGYFCGRYVIHHDRCIVYYDPLKL-ISKLGAKHIKDEHLEEFRRSLCD
TOMV L     YGYFCGRYVIHHDRCIVYYDPLKL-ISKLGAKHIKDWHLLEEFRRSLCD
TMV-KR     YGYFCGRYVIHHDRCIVYYDPLKL-ISKLGAKHIKDEHLEEFRRSLCD
PMMV       YGYFCGRYIIHHDRCIVYYDPLKL-ISKLGAKHIKNREHLEEFRTSLCD
TMGMV SPA  YGYFCGRYIIHHDKGAIVYYDPLKL-ISKLGAKHIKDYDHLEELRVSLCD
ORSV       YGYFCARYIIHHDRCIAIVYYDPLKL-ISKLGCKHIKSLDHLEEFRRSLCD
TVCV       YGYFCGRYVIHHDRCIAIVYYDPLKL-ISKLGCKHIRDVVHLEELRESLCD
CR-TMV     YGYFCGRYVIHHDRCIAIVYYDPLKL-ISKLGCKHIRDVVHLEELRESLCD
RMV-SH     YGYFCGRYVIHHDRCIAIVYYDPLKL-ISKLGCKHIRDEVHLEELRRSLCD
CRMV       YGYFCGRYVIHHDRCIAIVYYDPLKL-ISKLGCKHIRDEVHLEELRRSLCD
TMV-CG     YGYFCGRYVIHHDRCIAIVYYDPLKL-ISKLGCKHIRDEVHLEELRRSLCD
TMV OB     YGYFCGRYVIHHDRCIAIVYYDPLKI-ISKLGAKHITDKEHLEEFRLSLAD
CGMMV      YGYFCGRYIIHHANGCIVYDPDPLKL-ISKLGKNSLVGYEHVEEFRLSLD
CGMMV-W    YGYFCGRYIIHHANGCIVYDPDPLKL-ISKLGKNSLVGYEHVEEFRLSLD
CFMMV      YGYFCGRYVIHHANGCIVYDPDPLKL-ISKLGKNSLESYDHLEEFRLSLMD
YCGMMV     YGYFCGRYVIHHSNGCIVYDPDPLKL-ISKLGKNSLESYDHLEEFRLSLMD
SHMV       HGYFCGRYILRNGRYLRLPDPLKI-ITKLGCKAIKDWHLLEEFRLSMFD
POLIORDRP NVTFLKRFFRADEKYPFLIHPVMPMKEIHESIRWTKDPRNTQDHVRSCL
3D        -555--66666-----7777-JJJJJJJJJJ----KKKKKKKKKKKKKK
Footnote          77          88 8
TMV VUL    VAVSLNN-CAYYTQLDDAVWEVHKTAPPGSFVYKSLVKYLSKVLFRSLF
TMV-RAK    VAVSLNN-CAYYTQLDDAVWEVHKTAPPGSFVYKSLVKYLSKVLFRSLF
TMV WANG    VAVSLNN-CAYYTQLDDAVWEVHKTAPPGSFVYKSLVKYLSKVLFRSLF
TOMV L     VAESLNN-CAYYTQLDDAVGEVHKTAPPGSFVYKSLVKYLSKVLFRSLF
TMV-KR     VAVSLNN-CAYYTQLDDAVWEVHKTAPPGSFVYKSLVKYLSKVLFRSLF
PMMV       VAGSLNN-CAYYTHLNDVGEVIKTAPLGSFVYRALVKYLCDKRLFQTLF
TMGMV SPA  VACSLGNWCLGFPQLNAAIKEVHKTIDGSAFNCVNKFLCDKFLFRTLF
ORSV       VSSSLNN-CALFGQLNDAIAEVHKTAVNGSFAFCSIVKYLSD???????
TVCV       VASNLNN-CAYFSQLDEAVA EVHKTAVGGSFAFCSIIKYLSDKRLFRDLF
CR-TMV     VASNLNN-CAYFSQLDEAVA EVHKTAVGGSFAFCSIIKYLSDKRLFRDLF
RMV-SH     VTSNLNN-CAYFSQLDEAVA EVHKTAVGGAFFVYCSIIKYLSDKRLFKDLF
CRMV       VTSNLNN-CAYFSQLDEAVA EVHKTAVGGAFFVYCSIIKYLSDKRLFKDLF
TMV-CG     VTSNLNN-CAYFSQLDEAVA EVHKTAVGGAFFVYCSIIKYLSDKRLFKDLF
TMV OB     VSKSLNN-CAYYAQLDEAVREVHKTAPPGSFVYKCIKFLSNRVLFESLF
CGMMV      VAHSLFN-GAYFHLLDDAIHELFPNAGGCSFVINCLCKYLSKRLFRSLY
CGMMV-W    VAHSLFN-GAYFHLLDDAIHELFPNAGGCSFVINCLCKYLSKRLFRSLY
CFMMV      VAKPLFN-AAYFHLLDDAIHEYFPSVGGSTFAISSLCKYLSNKQLFGSLF
YCGMMV     VAKPLFN-AAYFHLLDDAIHEYFPSVGGSSFAINSCLKYLSKWLFRSLF
SHMV       MACEYKN-CFGFDVLES AVKESFPAEGCNVAFCAIYKFLSNKYLFRTLF
POLIORDRP LAWHNGE-EEYNKFL-----AKIRSVPIGRALLPEYSTLYRRWL
3D        KKKK--L-LLLLLLL-----LLLL--MMM-----NNNNNNNNNN
Footnote          8          0
TMV VUL    ID
TMV-RAK    IN
TMV WANG    ID
TOMV L     LD
TMV-KR     ID
PMMV       LE
TMGMV SPA  LN
ORSV       ??
TVCV       FV

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CR-TMV	FV
RMV-SH	FV
CRMV	FV
TMV-CG	FV
TMV OB	F?
CGMMV	ID
CGMMV-W	ID
CFMMV	IK
YCGMMV	AK
SHMV	SD
POLIORDRP	DS
3D	NN

Footnote

- Footnotes:
- 1. N-terminal residues interacting with the thumb.
- 4. Three aspartates involved in metal ion binding at the active site.
- 5. Determinant of preference for NTP over dNTP. Could interact with 2' OH of substrate NTP.
- 6. Caps a helical turn
- 7. beta-turn.
- 8. Interaction across interface I
- 9. Interaction across interface I with Arg 456
- 0. See 9.
- a. Extra residues are present between helix H and beta-2 for poliovirus and between helix D and helix C for tobamoviruses. Their sequence similarity (YKGID for polio vs. LDSID for ToMV) suggests that they may serve similar functions in providing part of Interface I.

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